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— *The Political Science Quarterly* for June, 1889, opens with a study of "Municipal Government in Great Britain," by Albert Shaw of the *Minneapolis Tribune*. The article is based on prolonged and direct investigation, and goes behind the legal institutions to show their actual working. J. Hampden Dougherty describes the movements of the last forty years for amendment of the New York State Constitution, discussing especially the various projects for the reform of our city government. Frederick W. Whitridge writes on "Rotation in Office," advocating a repeal of the four years' law, which he regards as the basis of the spoils system. E. P. Cheyney of Pennsylvania University criticises from a social and economic point of view the decisions of the American courts on conspiracy and boycott cases. Professor J. W. Jenks of Knox College, Illinois, gives a history of the whiskey trust, and its effect on prices. The number contains the usual reviews, by specialists, of recent economic and political literature, and a record of political events continued from the last record published in the *New Princeton Review*.

LETTERS TO THE EDITOR.

A New Chemical Experiment

(which it would not be well to repeat very often).

LATELY, in my lecture to my class on phosphorus and its compounds, I made hydric phosphide in the usual way, by boiling phosphorus in a strong solution of potassic hydrate. That the class might see that phosphorus melted in an alkaline solution would remain in a liquid state after the solution had cooled, I left the pint flask containing the solution *in statu quo* until the next recitation. I had done the same repeatedly, but never before leaving it for so long a time as on this occasion, — from Friday until Monday. On entering the lecture-room on Monday morning, I observed the flask, and remarked, "All right, the phosphorus is still in a liquid condition;" and, mechanically taking up the flask, I gave it a slight shake, when it immediately exploded with a loud report, shattering the flask into minute fragments, and scattering its contents in every direction; the phosphorus, fortunately, instantly solidifying. So, save a slight cut on the wrist, I escaped without injury. It would be interesting to know if any one else ever experienced a like explosion, and the probable explanation of the explosion. A possible explanation is, that the gas had by adhesion become condensed around the phosphorus as the solution cooled, and that, the slight shake overcoming the adhesion, there was a rapid evolution of the gas. It would not be advisable to repeat the experiment without the face and hands and clothing were well protected. In this connection I would urge that it would be well if chemists, on noticing any like dangerous phenomena not laid down in the text-books, would publish the fact for the benefit of the brotherhood, to prevent serious accidents.

I well remember how near I came meeting with a serious accident from the explosion of a large piece of sodium thrown upon water; the old text-books, written when the price of sodium was as great as for potassium, thus rendering the former too expensive to use except in very small quantities, stating that sodium would not take fire like potassium. The explosion of sodium has resulted in the devising of that most brilliant of all chemical experiments, the ice-volcano.

It is not, perhaps, generally known that iodide of nitrogen, if left standing in aqua ammonia for twenty-four hours, will explode while wet; and even when freshly prepared, if partially dried and then scattered over the surface of a tank of water, it will for hours after

repeatedly explode on slightly agitating the water. Many years ago I devised a method of exploding with safety a mixture of phosphorus and potassic chlorate, which I give for the benefit of the young experimenter. Place powdered potassic chlorate (no more than will cover a nickel, if exploded within doors) upon a board, and wet it with a solution of phosphorus in carbon disulphide (an inch of phosphorus will dissolve in an ounce and a half of carbon disulphide in a few minutes). In from five to ten minutes, or as soon as the mixture is dry, touch it with a long pole, or even stamp heavily on the floor, and a loud explosion will result.

A quantity sufficient to cover a dollar out in the air will shatter a thick plank, and make considerable of a hole in the ground. I have never experimented with large quantities, but presume that rocks might be thus shattered.

J. R. EATON.

Liberty, Mo., June 1.

Relative Frequency of Letters and Combinations.

IN a recent number of the *Phonographic World* a correspondent asks, "In English composition, (1) what is the relative frequency of the occurrence of the various letters of the alphabet; (2) in what proportion does each letter precede and follow each other letter of the alphabet; and (3) what syllables occur the most?"

In answer to the first question, it may be stated that in a font of type for printer's use, as supplied by type-founders, the different letters are usually supplied in about the following proportion: *e*, 1,200; *i*, 900; *z*, 865; *a*, 850; *n*, *o*, and *s*, 800 each; *h*, 640; *r*, 620; *f*, 450; *d*, 440; *l*, 400; *u*, 340; *c* and *m*, 300 each; *w* and *y*, 200 each; *g* and *p*, 170 each; *b*, 160; *v*, 120; *k*, 80; *q*, 50; *j* and *x*, 40 each; *z*, 20.

Some years ago I undertook to analyze 10,000 words of everyday English, from the editorial columns of twenty leading dailies, 500 words from each, selected from articles in which no undue prominence appeared to be given to any particular word. My object was to ascertain what combinations of two or more letters occurred with greatest frequency. My eyesight failed before my task was half completed; but the result of my labors, as far as they went, may be of interest in connection with the foregoing questions. In 3,500 words, as far as my analysis extended, I found that two-letter combinations occurred as follows: —

Times.	Times.	Times.	Times.
th..... 605	is..... 175	as..... 111	me..... 89
in..... 314	at..... 173	it..... 111	ma..... 88
an..... 312	of..... 153	al..... 110	co..... 85
of..... 236	es..... 128	he..... 94	be..... 77
re..... 232	se..... 121	ha..... 93	le..... 77
er..... 227	ed..... 120	ve..... 92	pr..... 72
on..... 226	to..... 120	de..... 91	la..... 71
en..... 186	ar..... 117	ou..... 90	ll..... 70

This, of course, does not answer the questions asked, but the material furnished may be of some assistance to the inquirer, should he wish to pursue the subject further.

It may be added, that, in the number of words mentioned, the word *the* occurred 250 times; *of*, 180 times; *and*, 144 times; *to*, 79 times; and *in*, 74 times. 918 words occurred only once each, 163 twice, and 65 three times. The three-letter combination *the* (in *there*, *them*, etc., as well as alone) occurred 400 times; *and*, 172 times; *ing*, 114 times.

A very suggestive point to type-writer manufacturers and inventors is the fact that in all these words the letter *z* occurred but 8 times, while *th* occurred 605 times, and *the*, 400 times.

H. J. T.

New York, June 4.

INDUSTRIAL NOTES.

A New Photographic Lens.

THE Messrs. Beck have just turned out of their factory, and Morris Earle & Co., 1016 Chestnut Street, Philadelphia, have received from them, a new combination of their excellent lenses whereby one Iris diaphragm tube is adapted to carry three different sets of lenses, so that a photographer can take 4×5 , $4\frac{1}{2} \times 6\frac{1}{2}$, and 5×8 views by means of adapting the three sets of lenses. Messrs. Earle & Co. have also recently received a new four-inch

rectilinear, with Iris diaphragm, from the same firm, — the smallest lens they have ever turned out for photographers' purposes. This is meant to take lantern-slide negatives particularly, and is one of the finest lenses ever received from them.

A Beautiful Portfolio of Paintings in Water Colors.

The manufacturers of the well-known Scott's emulsion of cod-liver-oil are issuing the most beautiful portfolio of eight artistic studies (birds and flowers) that has ever come under our notice. This work is worth at least two dollars, but Messrs. Scott & Bowne, with their usual enterprise, have made arrangements

whereby they can supply a copy by mail to any one who will write to them, enclosing twenty-five cents in stamps or post-office order. This is a chance seldom offered, and all lovers of art should avail themselves of it. Mention this paper, and address Scott & Bowne, 132 and 134 South Fifth Avenue, New York.

Magnesium Flash-Lamp.

A lamp for burning pure magnesium has been invented by Mr. E. M. Pine, one of the most successful of amateur photographers, whose flash-light photos were awarded the first prize at the Pittsburgh exhibition in 1888. Recognizing the danger attending the use of the various explosive compounds heretofore used for illuminating, Mr. Pine has succeeded in inventing a lamp for burning



pure magnesium, as shown in the accompanying illustration, after much experimenting, and believes his lamp, for brilliancy, rapidity, and simplicity, as has been pronounced by professional photographers who have tested it, to be a most complete flash-lamp. Its construction is said to insure perfect combustion; and, as magnesium is non-explosive, absolute safety is assured. The lamp is so portable that it can be easily carried in the pocket, weighing about four ounces.

Paris Exposition and International Congress of Electricians.

James W. Queen & Co., Philadelphia, call the attention of college professors and others interested in scientific work, who are intending to visit the Paris Exposition this summer, to the following facts. They have most excellent representatives in Paris who

have had the experience of many years in the selection and purchasing of scientific apparatus of every description for college use. In consequence of this, it has occurred to them that it might be a convenience to their patrons when in Paris to be supplied with letters of introduction to these agents.

By means of such letters, those professors who intend purchasing apparatus will have the assistance of competent persons, who are well acquainted with all the prominent makers, their apparatus, and prices. Thus much valuable time may be saved that might otherwise be spent in hunting up dealers and making bargains with them, — a rather unsatisfactory operation, especially to those not thoroughly conversant with the French language. Furthermore, it is often a great inconvenience and annoyance, after apparatus may have been purchased satisfactorily, to attend to the details of shipping and passing through the United States Custom-House "free of duty." James W. Queen & Co. will be pleased to relieve purchasers entirely of all this care, so that they need have nothing to do but select the apparatus.

Another advantage of this arrangement is, that there need be no expenditure on the part of colleges at the time of ordering apparatus. Apparatus ordered through these agents will be forwarded in the firm's weekly shipments as soon as a few pieces are ready, thus saving much time.

Those among the electrical fraternity who expect to attend the International Congress of Electricians will please note that they as well as college professors will find it to their advantage to advise with the firm's agents before buying apparatus for their companies or for themselves personally. Messrs. Queen & Co. do not wish professors or electricians, if they avail themselves of the offer of letters of introduction, to feel under obligations to purchase any thing. They will also be pleased to furnish letters to their agents in England, Germany, and Switzerland, if desired.

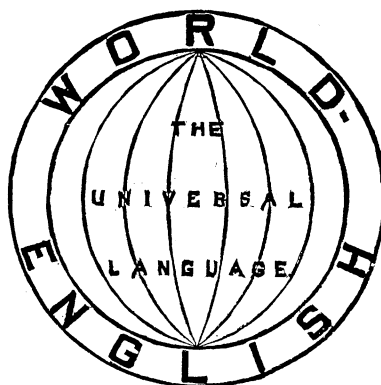
ONE LANGUAGE FOR THE WHOLE WORLD.

WORLD-ENGLISH :

THE UNIVERSAL LANGUAGE. 25 CENTS.

EVERY one has heard of the butcher who, after a long search for his knife, at last found it in his mouth: so speakers of English have been seeking for a universal language, when, lo! it is in their mouths. The intelligibility of English words has been obscured by a dense mist of letters. This is now dispersed by A. Melville Bell, who has already won a world-wide reputation through his invention of "Visible Speech," the great boon to deaf-mutes. Professor Bell calls this new discovery of his "World-English," and the result is a language which cannot fail to meet with acceptance, and at once supersede the supposed necessity for "Volapük," or any other artificial language. No language could be invented for international use that would surpass English in grammatical simplicity, and in general fitness to become the tongue of the world. It is already the mother-tongue of increasing millions in both hemispheres, and some knowledge of the language is demanded by all educated populations on the globe. Social and commercial necessities require that the acquisition of this knowledge shall be facilitated, and it is believed that Professor Bell's invention has removed the last impediment to English becoming the universal language, for which vague desires have long been entertained, although hitherto only futile efforts have been made.

Ex-President Andrew D. White, of Cornell University, says: "I believe that the highest interests of Christian civilization and of humanity would be served by its adoption. China and Japan would be made English-speaking peoples within fifty years, and so brought within the range of Christianizing and civilizing ideas, in the largest sense. All existing missionary work is trivial as compared with this. For your system would throw wide open those vast countries, as, indeed, all the countries of the world, to the whole current of English and American thought."



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No special training is required to qualify teachers for using this book. The subject can even be successfully introduced in the kindergarten and the nursery. This phonetic mode of initiation in reading cannot be too strongly urged on the attention of School Boards on both sides of the Atlantic.

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"World-English" and "Hand-Book of World-English" can be had of all booksellers, or will be sent for 50 cents, post free, by the publisher,

N. D. C. HODGES, 47 Lafayette Place, New York.